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Nutritional and health status of the Jarawas : A preliminary report

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Abstract : The Jarawas are one of the hunting-gathering Negrito tribes of Andaman Islands, who very recently come into contact. Information related to Nutrition and Health status of this tribe is very scanty; here an attempt is made to record the nutritional and health status of this tribe with minimum changes in their life-styles due to outside influence. So that future changes may be judged keeping this study as a base line data. The findings show that Jarawas have lower BMI value than some of the other Negritos. The food intake and resource availability of the Jarawa territory do not correspond with the low BMI, so, attempt is also made to interpret the low BMI of this tribe.

INTRODUCTION

The Jarawas are one of the hunting gathering Negrito tribes of Andaman Islands. In some classifications, the term Negrito is used for pygmies of Southeast Asia, while in others it designates all pygmies with hunting and gathering economy. Some writers consider Negritos- the most primitive humans, it has been contended by some writers that the Negrito type is found in Congo region, the Malay Peninsula and New Guinea. However, to the anthropologists the term Negritos are applied to the Asiatic pygmies only. Early India, in this view, was inhabited by Negritos, who have survived in pure form in Andaman Islands, believed to be the only area of the world where the entire indigenous population is Negrito (Taylor, 1986).

They are residing in South and Middle Andaman region and leading a semi-nomadic way of life, and meager information about them were available before our study (Anthropological Survey of India). They are not allowing outsiders to make contact with them and are unfriendly to the outsiders. In spite of friendly contact established from April 1974, only a section of Jarawa were befrionded but recently from October 1997, they themselves came ahead to meet the neighbouring population and as a result we are able to conduct our fieldwork successfully.

There are no exact population figures available till date and so far from our experiences and contacts with the individuals we are of the opinion

that their number may be between 350-400 only. From April 1974 many researchers from Anthropological Survey of India got opportunity to visit and contact them (Unp.). It was the pioneering work of Sarkar (1985) who was able to collect Anthropometric measurements and later Dermatoglyphic data for the first time. Prasad (1997 Unp.) also collected some data on Anthropometric measurements as well as demographic aspects. First Ethnographic report of the Jarawa was available in 1990 (Sarkar, 1990). Gates (1940) reported ABO blood group system.

In the present paper an attempt has been made to assess the nutritional and health status in the light of other influencing factors as a first hand information, just before many changes were taken place so that future consequences may be judged comparing with the present findings.

MATERIALS AND METHODS

Data for the present study were collected in two phases from 30th November to 20th December 1998 and from 22nd March to 13th April 1999 from Jhulan Pathar, Lakra Lungta, Police Station and Primary Health Centre in Kadamtala in Middle Andaman region and Middle Strait Jetty, R. K. Nallah area and Tirur of South Andaman Region. The study comprised 25 males and 16 females only.

The Anthropometric measurements were taken according to the method suggested by Martin and Saller (1957) and Singh and Bhasin (1968). Stature was measured by Anthropometric rod. Utmost care was taken during measurements to keep the subject as possible as to the suggested position. Chest circumference was taken as normal chest circumference. Omron Digital M1 Blood Pressure monitor was used for taking blood pressure and pulse rate and a clinical mercury thermometer was used to take the body temperature. Blood pressure was measured from left arm and temperature from armpit area. All circumference measurements were taken using steel tape nearest to 0.1 cm. Body weight was recorded using a portable weighing machine nearest to 0.5 kg. The Una made Harpenden type skin fold caliper was used for skin fold thickness measurements nearest to 1 mm.

The following measurements were considered. Stature, Body weight, Biacromial diameter, Bi-iliocristal diameter, chest, waist, hip, thigh, calf and arm circumferences along with Biceps and triceps fat folds. Among the physiological parameters. Blood pressure, pulse rate and body temperature were taken.

The following indices were used for Nutritional & health status assessments. Body Mass Index (BMI or Quelet's Index), Weight-Height ratio (W/H) along with the Arm muscle circumference and arm muscle area (Heymsfield et al. 1984), Arm fat area (Gurney and Jelliffee 1973), Energy protein Ratio (Amador et al. 1975), Conicity Index (Valdez et al. 1993), Percentage body fat were calculated using the formulae of Black et al. (1983). Fat free mass was estimate using the prediction equation of Hume and Wyres (1971). Waist-Hip ration is also calculated to see the abdominal adiposity.

NUTRITIONAL HABITS

About the Jarawa territory and available resources other paper deals in details. In short it can be mentioned that they enjoy a vast territory of tropical rain forest from South to Middle Andaman. The forest has immense carrying capacity as well as the creeks and seashores are also containing plentiful resources. Data on food habits were collected by so many researchers from time to time of Anthropological Survey of India as well as from other allied disciplines also. They got the wild boar and big monitor lizard, various kinds of fruits, roots and tubers in the forest (Sarkar 1992). They exploit marine resources easily. Honey is another important food item. The protein content of their diets are very rich in quality and most of the essential amino acids they get from animal sources. Two kinds of tubers viz. *Dioscoria bulbifera (Nad-Hada)* and *Dioscoria Pentaphylla (Pug/Puk)* frequently used by them are of very rich starch content, as good as cereals, besides immense medicinal value. The tubers may occupy a vital place in their food items. Food preparation is by roasting; baking, as well as boiling and sometimes food items are consumed raw. In summary, it can be said that their diets are very balanced one, since they are exploiting both the terrestrial as well as aquatic resources easily, so the shortage of one kind of food are supplemented by another one.

RESULTS AND DISCUSSION

The Jarawa males are of short to lower medium range of stature, majority is of short stature (males 60% and females 75%) for both the sexes. The mean height of male is 12.06 cm more than that of the females and the difference is statistically significant. The index value shows that majority has narrow to medium shoulder, pelvis and chest (Table 1-4). The majority is also dominated by brachicephals, dolichocephals are absent as the norm (Ref.1). The mean body weight of male is also around 4 kg. more than the females and the difference is also statistically significant.

Table 1: *Stature : Range Variation (According to Martin)*

	Male (cm)			Female (cm)		
		n	%	Range	n	%
Very short	130-149.9	07	28.00	121.9-139.9	4	25.00
Short	150-159.9	15	60.00	140-148.9	12	75.00
Lower medium	160-163.9	03	12.00	149-152.9	—	—
Range	144.7-163.2			133.6-147.8		
Mean	153.68			141.62		
SD	5.11			3.98		

Table 2. *Relative Biacromial Breath Index Or Biacromial Breadth - Stature Index Range Variation (According to Brugsch)*

	Male (cm)			Female (cm)		
		n	%	Range	n	%
Narrow shoulder	X-22.0	10	43.47	X-21.5	9	60
Medium shoulder	22.1-23	10	43.47	21.6-22.5	9	40
Broad shoulder	23.1-X	3	13.04	22.6-X	-	-
Range	19.70-23.81			18.95-22.42		
Mean	21.62			21.04		
SD	1.27			0.94		

Table 3 : *Relative Bicristal Breadth Index Or Bicristal Breadth-Stature Index Range Variation (According to Brugsch)*

	Male (cm)			Female (cm)		
		n	%	Range	n	%
Narrow Pelvic	X-16.4	14	87.5	X-17.4	08	66.66
Medium Pelvic	16.5-17.4	01	6.25	17.5-18.4	02	16.66
Broad Pelvic	17.5-X	01	6.25	18.5-X	02	16.66
Range	14.60-17.80			15.76-20.21		
Mean	15.90			17.49		
SD	0.78			1.23		

Table 4 :*Relative Chest Girth Or Chest Girth-Stature Index Range Variation (According to Martin & Saller)*

Range Variation		Male (cm)		Female (cm)	
		n	%	n	%
Narrow Chest	X-50.9	9	37.5	02	14.28
Medium Chest	51.0-55.9	15	62.5	11	78.57
Broad Chest	56.0-X	-	-	1	7.14
Range		45.81-55.99		49.48-69.23	
Mean		49.18		57.91	
SD		9.76		5.04	

The Body Mass Index (BMI) is most commonly used for Nutritional Assessment; it is more appropriate due to independent of height. Problems arise, however, in adult whose body shape differs from the norms, particularly whose legs are shorter or longer than the expected value of height (WHO 1995). The mean value of BMI for Jarawa males and females are 18.90 (Kg/m^2) and 19.79 (Kg/m^2) respectively. Table-6 shows the distribution of BMI value of Jarawa according to WHO (1995) category. Two males (8%) fall in severe thinness category and remaining comes under

mild thinness to normal range. It is noteworthy here that not a single individual comes under obese category. 48% males and 31.25% females come under thinness category and the remaining are in normal category. On the other hand females does not come under the severe thinness category. The figure in parentheses of the Table-6 shows the distribution of BMI with addition of a single unit.

The Arm circumference is also used to assess the malnutrition alone or with the combination of other measurements. The value of arm circumference ranges from 20.0-26.8 cm among males with the mean value 23.39 cm and 21.5-27 cm in females with the mean value of 24.70 cm. Around 58% males and 46.66% female's arm circumference value comes below the cut-off point suggested by WHO (1995). The remarkable fact is that the mean values of females are more than males. Similarly, the mean value of Arm muscle area, arm fat area, Biceps skin fold and triceps fat fold surpass the male value; but the Arm muscle circumference value is higher in male (Table 5).

BMI below 18.5 suggest adult malnutrition. On the other side, adult with a BMI below 16.0 or with odedamatous malnutrition needs hospitalization (WHO 1999). Besides, BMI, Arm circumference, Arm muscle circumference and arm muscle area are also used to assess the malnutrition. Arm muscle circumference is of greater significance in clinical studies, because it is directly related to the severity of diseases. Heymsfield et al. (1984) shows that if Arm muscle area is reduced to 10 cm^2 death invariably occurs. In a clinical setting, Arm muscle circumference below the 5th US Percentile indicates adult malnutrition. A triceps of 1-2 mm, a total body fat 1-3 kg. or an AMA of 9-10 cm^2 is pointers to imminent death from inanition.

The minimum value of triceps (males 5 mm, female 8 mm), Arm muscle area (males 24.99, females 29.04) and total body fat (males 2.94 kg, females 5.06 kg) are much more away from the inanition point.

Two males who came in thinness category i.e. BMI>16 does not show any sign of lethargy or idleness and easily performing daily necessities. Among the two, one is of old age and was suffering from some upper

respiratory tract infections before taking measurement. The other person is of exceptionally of low body weight and height. In male series of data, most of the minimum value of measurement he shows. It is interesting here to mention that after three months both the persons are quite normal and the old person also seems healthier than the previous time.

Table 5. : *Variable and Indices Related to Nutritional Status*

Female					Male		
T Test Value	SD	Mean	Range		Range	Mean	SD
1.00	9.37	28.18	18-50	Age (Yrs)	18-60	31.68	12.94
8.49	3.98	141.62	133.6-147.8	Stature (cms)	144.7-163.2	153.68	5.11
2.71	5.20	39.78	30-52	Body Weight (Kgs)	32-54.5	44.1	4.65
1.32	2.27	19.79	16.21-24.63	Body Mass Index (Kg/m^2)	15.09-21.70	18.90	1.97
9.11	2.92	29.02	24.06-33.95	Fat free mass (Kg)	30.43-42.59	37.13	2.61
3.81	2.57	8.88	5.06-15.32	Total body fat (Kg)	2.94-9.37	6.18	1.64
1.32	3.38	22.31	16.88-29.47	% Body fat	9.20-18.22	13.90	2.40
2.92	2.97	11.6	8-21+	Triceps Skin fold (mm)	5-16+	8.68+	3.35
2.11	1.69	24.70	21.5-27.0	Arm circumference (cm)	20.0-26.8	23.39	2.05
1.23	2.55	19.69	15.64-26.4	Arm muscle circumference (cm^2)	17.72-24.91	20.59	1.73
3.97	7.63	42.75	29.04-55.49	Arm muscle area (cm^2)	24.99-49.42	33.56	5.94
1.61	3.67	12.38	8.13-21.91	Arm fat area (cm^2)	3.95-21.63	10.26	4.52
0.69	34.24	280.53	219.94-357.88	Weight/Height ratio	219.78-341.05	287.71	29.07
0.51	1.82	121.76	108.35-134.22	Energy/Protein ratio	91.62-149.45	119.78	17.10

Table 6 : *Body Mass Index category of Jarawa according to WHO (1995)*

Category		Male		Female	
		n	%	n	%
Severe thinness	<16.0	02	08	-	-
Moderate thinness	16.0-16.9	03	12	03	18.75
		(02)	(08)		
Mild thinness	17.0-18.4	07	28	02	12.5
		(03)	(12)	(03)	(18.75)
Normal Range	18.5-24.99	13	52	11	68.75
		(20)	(80)	(12)	(75.00)
Overweight	>25.0	-	-	(01)	(16.25)

HEALTH STATUS

Health of an individual or community depends on several factors : Ecological condition, house type, sanitary practices, way of life styles and food and nutrition etc. Most of the Jarawas show the marks of accidental injury, which may arise due to their life styles. Nutritional deficiency signs were almost absent, but the reddish hair of the children may attract non-Jarawa, which is the result of the application of red ochere. Though some of the children show a bulging belly, but only two children show the sign of parasitic infection, later on confirmed by physician, not pathologically, but clinically and again it was re-confirmed because belly continue to bulge. This may arise due to their frequent visit in settlement area and taking some infected food.

Ringworm was noticed in Nov-Dec-1998 and afterwards it turned into an epidemic, around 70% of the population of both the sexes suffers from this; though previous report does not mention about the ringworm (Unp. Anthropological Survey fo India Report).

Upper respiratory tract infections were noticed but tuberculosis was

Table 7 : *Showing Comparison of Jarawa with Kung! San and Onge*

Female							Male						
W/H Ratio	BMI (Kg/m²)	Triceps (mm)	MUAC (cm)	Body Wt. (Kg)	Stature (cm)		Stature (cms)	Body Wt. (Kgs)	MUAC (cms)	BMI (Kg/m²)	Triceps (mms)	W/H ratio	Reference
280.53	19.79	11.6	24.70	39.78	141.62	Jarawa	153.68	44.10	23.39	18.90	8.6	287.7	Present Study
								8	1				
	19.10			42.6	149.2	Kung San!	160.7	49.6		19.40			Kirchengast 1998
		11.7	24.9	43.0	140.4	Onge 1	149.8	43.2	24.0		5.9		RAo et al. 1969
		17.8	25.8	43.3	140.4	Onge 2	151.8	47.7	26.1		7.7		Rao et al. 1989
284.50				40.92	140.55	Onge 3	150.4	45.27				296.60	Awaradi 1992

not reported. It is noteworthy that the persons who show the symptoms of upper respiratory infection are quite normal and healthier in dry season, i.e., in March-April 1999 and other person also not infected in this season. The seasonal changes and consumption of honey and other available resources of this season may be responsible for this. Table 8 shows the value of measurements and indices related to adiposity. The conicity index which measure central adiposity and unlike waist-hip ratio, it takes account the overall adiposity of the individual and is also independent of hip circumference. This has an advantage when comparing the ethnic groups who differ in bone size (Wardle, Wrightson and Gibson 1996). Conicity has been reported to be associated with various chronic heart disease factors to a similar extent as waist-hip ratio (Valdez, Seidell, Ahn and Weiss 1993, Mueller, Meininger, Liehr, Chand Chandler 1996). The mean value of Conicity Index is 1.40 of females and 1.50 of male and the waist-hip ratio is 0.89 for male and 0.82 for females. It is interesting here that the hip circumference of male is lesser than the female (83.02 cm for females and 79.24 cm for males) and on the otherhand waist circumference value is higher among the males than females. The high value of waist-hip ratio in male is not due to adiposity rather than due to lesser value of hip and the higher value in female is due to high value of hip circumference where stoatopaegia play major role. So though waist-hip ratio value in male is higher i.e. more that 0.85 (WHO 1990) it cannot be misinterpreted as obesity.

The usefulness of Energy/Protein Index (E/P) in nutritional assessment has been demonstrated (Amador et.al. 1980) and higher value has been found in overweight subject than lean one (Amadore, 1978), and it is used for the diagnosis of obesity. The Energy/protein index value in male ranges form 91.62-149.95 with a mean value of 119.78 and in female it ranges from 108.35-134.22 with a mean value of 121.76.

The blood pressure, pulse rate and body temperature are under the normal range. The mean value of systolic and diastolic blood pressure in male is higher than females i.e. Systolic blood pressure of male is 111.73 and female is 100 and Diastolic blood pressure of male is 75 and of female is 68.33. Table 8 gives the detail of the values.

Due to contact of the Jarawa with the neighbouring people i.e. settlers and tourist new kind of diseases they got as a gift, which are unknown to them and their immune system fail to fight as well as it cannot be cured by their traditional medicines. In May 1999, they were infected by Pneumonia. The occurance of three deaths may be due to this major killer disease. The disease spread rapidly and turns into an epidemic, though it was timely controlled. They have also their own system of medicine, sometimes some herbs and other material were observed for curing diseases. They use some bark to wrap the whole body to control high temperature and water are also added when the bark looses its original moisture.

Table 8 : *Variables and indices related to obesity and health status*

Female					Male			
n	SD	Mean	Range		Range	Mean	SD	n
16	9.37	141.62	133.6-147.8	Stature (cms)	144.7-163.2	153.68	5.11	25
16	5.20	39.78	30.0-52.0	Body weight (kgs)	32-54.5	44.1	4.65	25
15	6.23	68.34	59.2-84	Waist Circumference (cm)	64.2-80.2	71.18	4.01	24
15	6.13	83.02	72.6-92.5	Hip Circumference (cm)	71.0-89	79.24	4.63	24
15	0.07	0.82	0.73-0.95	Waist-Hip Ratio	0.83-1.06	0.89	0.05	24
15	0.08	1.40	1.30-1.55	Conicity Index	1.37-1.73	1.50	0.08	24
15	7.06	121.76	108.4-134.2	Energy-Protein Ratio	91.62-149.50	119.78	17.10	24
12	12.1	100	72-118	Systolic BP	97-124	111.73	10.10	15
12	8.44	68.33	54-78	Diastolic BP	62-90	75.00	9.84	15
12	12.30	84	60.99	Pulse rate	65-87	72.46	11.60	12
11	0.82	97.34	96.0-98.4	Body Temperature (°F)	96.2-98.2	96.95	0.62	12

INFERENCES

Observation on their diet pattern and particularly food intake does not corroborate with the Body Mass Index and arm circumference. The BMI category of WHO are based on affluent society or the society where

food security is, and similarly they lead more sedentary life than hunter-gatherers. The comparison of the Jarawa with other pygmy populations i.e. Onge and !Kung San also show low BMI and more individuals come in thinness category. On the other hand the !Kung San and Onge show some obese individuals, but Jarawa do not. Interestingly, the Jarawa female are not much different from the other Negrito population. When the Jarawa were compared with the Onge of different time span i.e. 1969, 1989 and again of 1992, the mean value of the Jarawa male body weight is more than the Onge male of 1969, before their rehabilitation (Table 7). A later study shows that bodyweight of the Onge is always more than the value of 1969. The mean value of female body weight is around 3 kg. less than Onge in 1969, this may be due to inclusion of some individuals whose secondary growth has not taken place but mistakenly entered in the adult age group as correct age estimation of the Jarawa is difficult at this time. The mean age of the Jarawa female is here only about 28.18 yrs. While the bodyweight of the Jarawa female is very much close to the Onge female's value of 1992. Study of Sarkar (1989) also shows mean weight of Jarawa female as around 46.63 kg. It is worthwhile to say that "There is increasing evidence that dietary fat content may contribute to propensity to gain weight in adult life, which is particularly evident in middle-age. Low level of physical activity also appears to be a contributory factors" (WHO 1995).

If we compare the life style and food habits of the Jarawa with the Onge and !Kung San, a remarkable difference is evident i.e. though Onge practiced hunting gathering, but from 1976, their sedentary way of life increased more and also the diet pattern changed, most of the time they are getting food from Government Agency. Besides, smoking and liquor consumption are also practiced by them which are also the contributory factors getting more obese. Similarly, !Kung San of the present comparison also shifted from their traditional way of life styles. So with the comparison of !Kung San or Onge, nutritional status of the Jarawa will not be concluded. The finding also show that the fat content of diet in affluent society is much more high. The percentage of energy obtained from fat in hunter-gatherer society ranges from 15-20%, whereas in modern affluent society

this value is around 40% (Boydon, 1988). As mention earlier Jarawa are using food by boiling or roasting they are not using oil and spices in their diets.

How much a Jarawa male gains weight if lead sedentary life and ate the food of modern society? A male of around 15-17 years of age was hospitalized for about 20 days, he weighed 51 kg at the time of discharge and after three months he weighed only 47.5 kg. The weight difference of 3.5 kg was due to sedentary life. It clearly indicates that how their life-style play an important role in weight gain (obesity). So, when one is comparing this population with the genetically close populations, their life-style must be considered. When the present study is compared with the study of Sarkar (1989), it shows low body weight. The high value of Sarkar (1989) is probably due to small sample size.

Tobias (1964) and Lee (1979) interpreted the small stature and general thinness of San as an efficient adaptation to the demands of hunting and gathering subsistence, Jarawas are not exception to this. Definitely, their way of subsistence demands lean and small stature. It is so because running, walking a long distance, swimming and climbing are the daily routine of this group. "It has been suggested that there is no proportional difference when moving vertically, energy expenditure per unit body size is more or less the same regardless of absolute size (Taylor et. al. 1972, Aiello, 1992)". "Thus it will be more expensive for a large animal to climb than it is for a small one. It can be concluded that larger the unit, the more energetically expensive it is to move vertically. The walking cost of energy is around four times more than standing again climbing is about eight times expensive than walking (Eltons et al. 1998)." So there is not denial of the role of low body mass in foraging economy.

Body shapes of the Jarawa also may play a role in low Body Mass Index. The Cormic index (sitting height/stature), which provides a measure of the relative length of trunk and legs, varies between individuals and group. A Body Mass Index difference of 1 corresponds to 0.01 differences

in Cormic Index. The role of Cormic Index is well demonstrated among the Australian aborigines and shows a very good correlation value (Norgan N. G., 1994). Table 9 shows some Indices related to shape. Sitting height of only 6 individuals have been measured and Cormic Index value was calculated. The Cormic Index is highly correlated with Body Mass Index (r=0.71) in males but females show weak correlation (r=0.19). Though the sample size is small but Cormic Index value certainly gives a trend. In contrast, Nicobarese show high value of Cormic Index with higher value of Body Mass Index in comparison to the Jarawa.

Like Australian aborigines, there is also a general linearity of form among the Jarawa i.e. narrow shoulders, chest and hip and overall leanness especially males. Table 9 shows the value of correlation coefficient and show very good correlation in males. So the general linearity also contributes in low Body Mass Index. From the age trend of mean Body Mass Index in a sample of Chinese population, it is clearly reflected that the Body Mass Index value increases with increasing age upto 40-49 years of age and then declining. The sample here comprised individuals with very young age and also of old age i.e. 3 old age persona and one exceptionally lean and short and the person comes under severe thinness category are one old age and the other is exceptionally lean and thin one. The population is completely dependent on foraging way of subsistence, hence seasonal variation may also influences their health and nutritional status as the available resources vary seasonally. The findings of Harrison and Schmitt (1989) and Schmitt and Harrison (1988) suggest that the impact of environmental stress on body weight and nutritional status is sex specific. Women appear to be relatively 'buffered' from environmental stress compared with men, i.e. the influence of environmental stress on nutritional status is lower in women than in men. This hypothesis was corroborated by the findings of Dettwyler (1992) for adults from rural areas of Mali. The findings of November-December 1998 and March-April 1999 also show some variation in adult male only. The above-mentioned findings may also valid for the Jarawas, because in March-April 1999 the persons who come under severe thinness category appears to be comparatively healthier.

The Jarawas are enjoying optimum nutritional status though from some of the parameters the population shows some percentage of chronic energy deficiency especially from the point of Body Mass Index but on the other way it show good nutritional status. A Body Mass Index below 13 kg/m^2 in males and 11 kg/m^2 in females may be the lowest limit compatible with life. Much remains to be learned concerning the critical levels of Body Mass Index and body weight and its implications for health and function (Henry 1994).

Table 9 : *Measurements and indices related to shape and correlation coefficient*

Females					Males			
Correlation Coefficient	n	Mean			Mean		n	Correlation Coefficient
0.52	8	19.90	70.71	BMI-Sitting Height	20.63	76.06	6	0.53
0.68	14	19.46	75.10	BMI-Chest Circumference	18.72	78.46	24	0.81
-0.17	15	19.80	29.81	BMI-Biacromial Diameter	18.61	33.19	23	0.64
0.75	12	19.64	24.70	BMI-Bi-illiocristal Diameter	19.38	24.34	16	0.14
0.69	8	39.31	70.71	W-Sitting Height	45.5	76.06	6	0.71
0.83		38.96	75.10	W-Chest	44.25	78.46	24	0.89
-0.08	15	39.83	29.81	W-Biacromial Diameter	43.91	33.19	23	0.78
0.75	39.29		24.69	W-Bi-illiocristal Diameter	45.59	24.34	16	0.30
-0.30	8	19.9	49.91	BMI-Cormic Index	20.13	50.43	6	0.71
0.32	14	21.19	53.10	BMI-Chest Stature Index	18.72	51.10	24	0.89
-0.24		19.80	21.04	BMI-BD-Stature Index	18.61	21.61	23	
0.74	12	19.64	17.48	BMI-BID-Stature Index	19.42	24.34	16	0.75
-0.33	8	39.31	49.91	Weight-Cormic Index	45.5	50.43	6	0.73
-0.44	15	39.83	21.04	W-BD-Stature Index	43.91	21.61	23	0.55
0.50	12	39.29	17.48	W-BID-Stature Index	45.59	15.89	16	0.09
0.51	15	38.96	53.10	W-Chest-Stature Index	44.25	51.10	24	0.62

The minimum value of Body Mass Index in male is 15.09 kg/m^2 and in female 16.21 kg/m^2 are very far away from the critical limits. Further James et. al. (1998) proposed a Body Mass Index of around 12 might be the lower limit for survival. Though two individuals show chronic energy deficiency, but to reach at the critical limit, minimum weight loss required more than 5-7 kgs, that loss definitely not easily reached. Besides the category proposed by WHO (1995) also suggest to consider the Physical Activity level, which is here very high. Some of the diseases they have, but they are much more better than ours from the health status point as their diets contain plenty of fibre, less fat, more protein and performing very high physical activity as well as also spending more leisure time. They are nutritionally well balanced and a very healthy population.

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